EXHIBIT 15

Plaintiff's Technical Tutorial

Entropic Communications, LLC v. Charter Communication, Inc.
Civil Action No. 2:22-cv-00125-JRG

Submitted May 9, 2023

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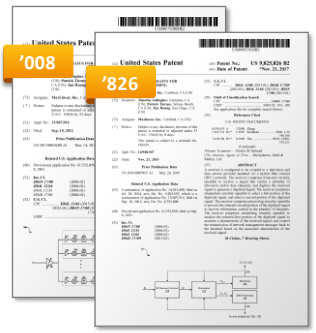
This is a technology tutorial by Plaintiff and Patent Owner, Entropic Communications LLC in the matter of *Entropic v. Charter Communications, Inc.* in Civil Action No. 2:22-cv-00125-JRG. This case involves six asserted patents that relate to systems and techniques for providing cable television and internet services and improving these services. Plaintiff thanks the Court for the opportunity to present this technical tutorial and hopes it will provide context for the asserted patents and the disputed claim terms.

Introduction

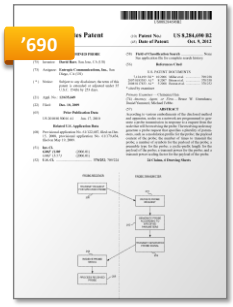
We begin with an overview of the six Entropic patents asserted in this case and the three categories of technology they fall into. We then provide a general technology overview of cable systems, with a particular focus on where the asserted patents are implemented therein. Lastly, we provide a detailed analysis of the three categories of technology as they relate to the disputed claim terms.

The Asserted Patents

Remote Network Troubleshooting

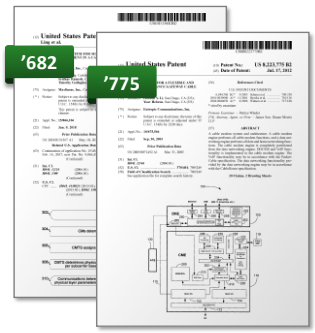


U.S. Patent Nos.
8,792,008 and 9,825,826
Priority Date: Sept. 8, 2011



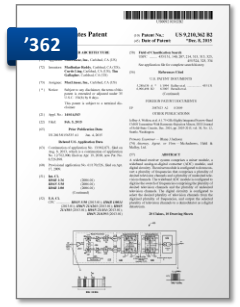
U.S. Patent No.
8,284,690
Priority Date: Dec. 15, 2008

Cable Network Performance Improvement



U.S. Patent Nos.
10,135,682 and 8,223,775
Priority Date: July 23, 2012 and Sept. 30, 2003

Full-Band Capture (FBC)



U.S. Patent No.
9,210,362
Priority Date: April 19, 2010

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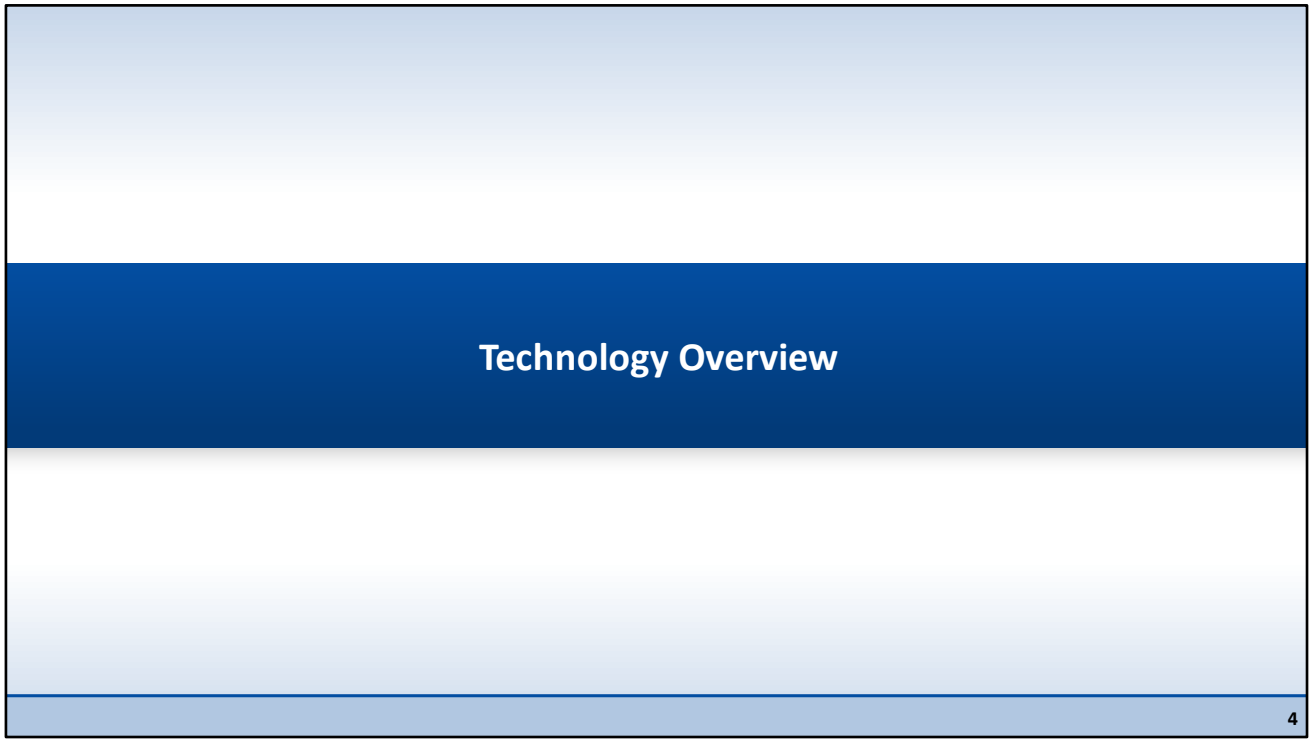
The asserted patents fall into three categories of technology:

Remote Network Troubleshooting, which includes the '008, '826, and '690 Patents. We address the '008 and '826 Patents together in places because the '826 Patent is a continuation of the '008 Patent, so these patents share a specification.

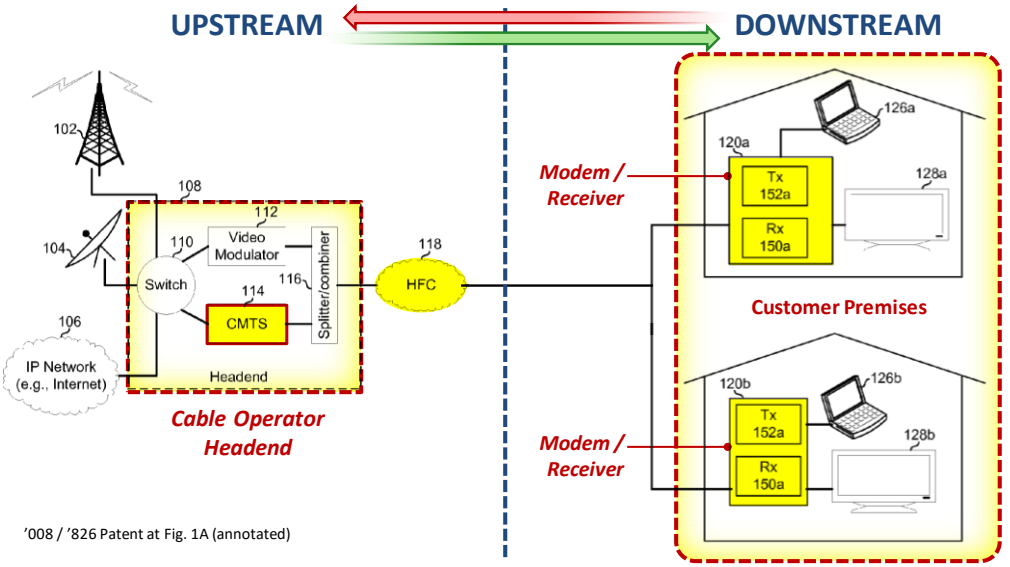
Cable Network Performance Improvement, which includes the '682 and '775 Patents; and

Full-Band Capture (FBC) (also known as Full-Spectrum Capture), which includes the '362 Patent.



We now provide a general technology overview of cable systems and architecture, beginning with a high-level overview and moving to the various components and how they relate to the disputed claim terms.

Technology Overview – Cable System Architecture



'008 / '826 Patent at Fig. 1A (annotated)

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Illustrated here is an overview of a cable system architecture. This Figure is from the '008 Patent and is helpful in identifying where the technology of the asserted patents are implemented within the cable system.

Two terms that are helpful to describe the specific locations in the cable system are "Upstream v. Downstream". In the context of transmitting signals, a signal is sent Downstream when it is sent away from the cable operator equipment or facilities to the customer premises. An example of a downstream bound signal is a television signal containing programing a customer wants to view on their television. A signal is transmitted Upstream when a signal is sent towards the cable operator equipment or facilities from a customer premises. An example of an upstream bound signal is a network management message regarding signal quality sent from equipment within the customer premises to the cable operator's equipment or facility.

The first component we will discuss is the "cable operator headend." This is a facility that receives an incoming signal—for example, from an antenna, satellite, or IP network—and then prepares the signal for transmission to the customer premises. Headend facilities are typically operated by the cable operator.

The next component we will discuss is the CMTS or Cable Modem Termination System. While the CMTS is typically located at the headend facility as shown, it can also be located near the customer premises. You may also hear the term CCAP, which is a Converged Cable Access Platform. A CCAP allows cable operators to use a single platform for offering traditional video and IP-based broadband services to the

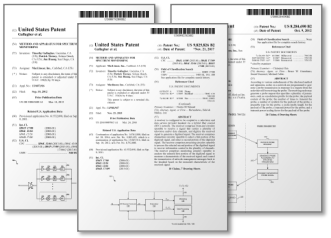
customer. For the purposes of this case and these technologies, a CMTS and a CCAP are very similar, and we will use the term CMTS throughout to refer to hardware and software the cable operators use to provide their services to their customers.

The next component we will discuss is the Hybrid Fiber Coaxial Network, or the HFC network, that connects the cable operator headend and/or CMTS to the customer premises. A HFC network includes a fiber optic network and a coaxial network, such as the networks used by the vast majority of cable operators in the United States. The fiber optic network is typically used to connect the various cable operator headends and other hardware used by the cable operator to provide their services, while the coaxial network is used for "last mile" delivery from the fiber optic network to the customer premises.

The final component is the customer premises. Various devices, often referred to as Customer Premises Equipment (sometimes referred to as CPE), are located at the customer premises. CPE can refer to a variety of devices such as cable modems, set top boxes, gateways, personal computers, televisions, and the like. We explore these on the following slides.

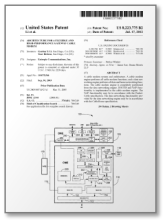
Technology Overview – Cable Operator Deployment on Customer Premises

Remote Network Troubleshooting



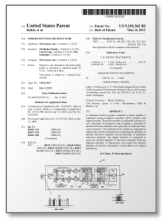
'008, '826, and '690 Patents

Cable Network Performance Improvement

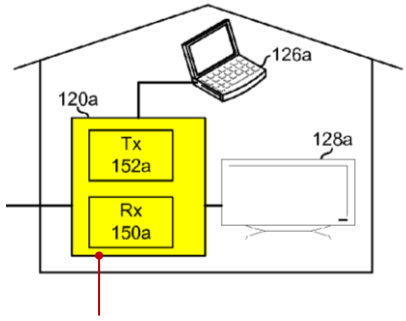


'775 Patent

Full-Band Capture (FBC)



'362 Patent



'008 / '826 Patent at Fig. 1A (excerpt)

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All three categories of technology involve Customer Premises Equipment in some capacity.

The **Remote Network Troubleshooting Patents** (the '008, '826, and '690 Patents) are directed to monitoring the signal received at the customer premises and reporting certain information back upstream to the cable operator.

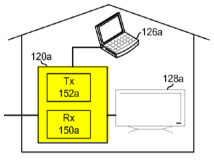
The **Cable Network Performance Improvement Patents** include the '775 Patent, which is directed to an improved design for the cable gateway device.

Lastly, the **Full-Band Capture Patent** (the '362 Patent) is directed to a wideband receiver system.

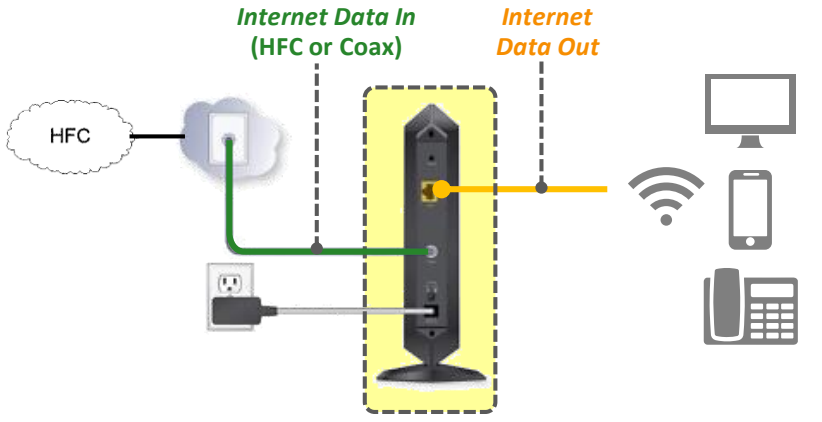
Technology Overview – Customer Premises Equipment

Cable Network Performance Improvement

'775 PATENT



Cable Modem: Connects to the HFC Network and Delivers Internet Service into the Home



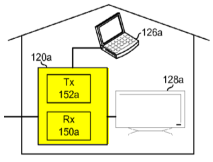
7

One specific piece of Customer Premises Equipment is a cable modem. A cable modem (sometimes referred to as a CM) connects to the HFC network via a coaxial connection and delivers internet service into the customer premises. The customer can connect various devices, such as computers, mobile devices, Voice over Internet Protocol (VoIP) Phones, game consoles, and the like to the cable modem using Ethernet cable or a wireless connection. Cable modems are often connected to routers in order to distribute the internet service to these devices.

Technology Overview – Customer Premises Equipment

Remote Network Troubleshooting

- '008 PATENT
- '826 PATENT
- '690 PATENT



Set-Top Boxes ("STB")

Delivering TV Content

Signal Monitoring

Measured / Monitored Signal Characteristics

Whole-Home DVR

8

An additional piece of customer premises equipment is the Set Top Box, or STB for short. A Set Top Box is sometimes called a receiver or a gateway. A Set Top Box receives and decodes a television signal and delivers TV content by selecting the desired channels and outputting the content for viewing or recording. Some Set Top Boxes provide whole-home DVR services which allows a customer to watch and record different TV programs on various devices within their premises.

A Set Top Box can perform a variety of signal monitoring and reporting functions that will be discussed in more detail shortly.

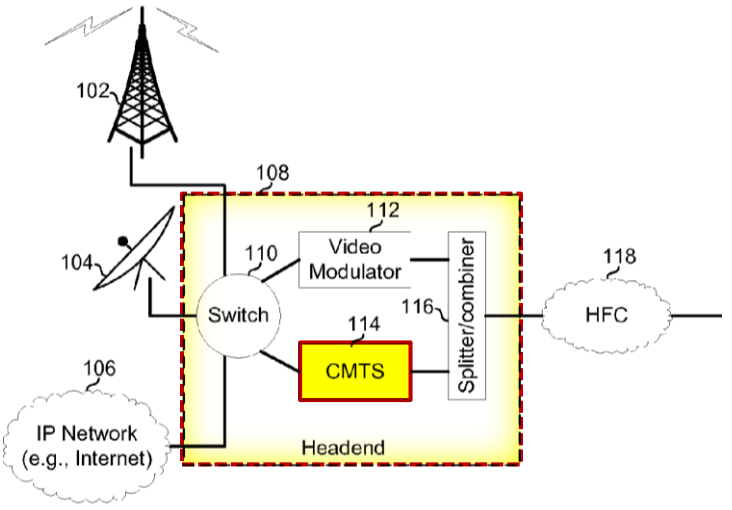
Technology Overview – Cable Modem Termination System (CMTS)

Cable Network Performance Improvement

'682 PATENT

Remote Network Troubleshooting

'690 PATENT



'008 / '826 Patent at Fig. 1A (excerpt)

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As previously mentioned, a CMTS is hardware and/or software that the cable operators use to provide their services to their customers. The CMTS can transmit data to and receive data from the cable modems via the HFC network. In addition, the CMTS is responsible for managing the cable modems and measuring performance of the HFC network. One way that a CMTS can manage cable modems is by organizing them into logical groups, such as service groups.

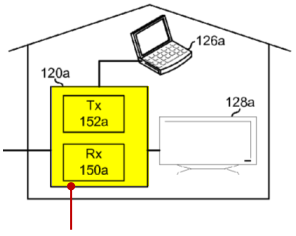
The '682 Patent involves the use of SNR metrics, or signal-to-noise ratio metrics, to organize cable modems into service groups for a CMTS.

The '690 Patent involves probing customer premises equipment and reporting information back upstream to the CMTS. This enables remote diagnosis of service issues.

Technology Overview – Full-Band Capture (FBC) / Full-Spectrum Capture (FSC)

Full-Band Capture (FBC)

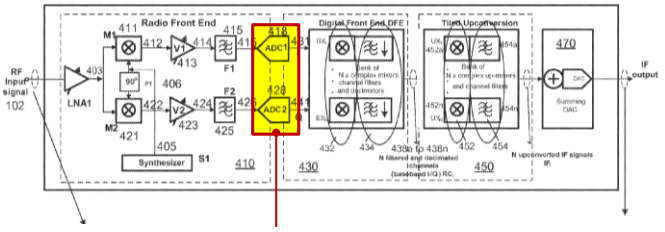
'362 PATENT



Modem / Receiver

'008 / '826 Patent at Fig. 1A (excerpt)

Wideband Receiver System

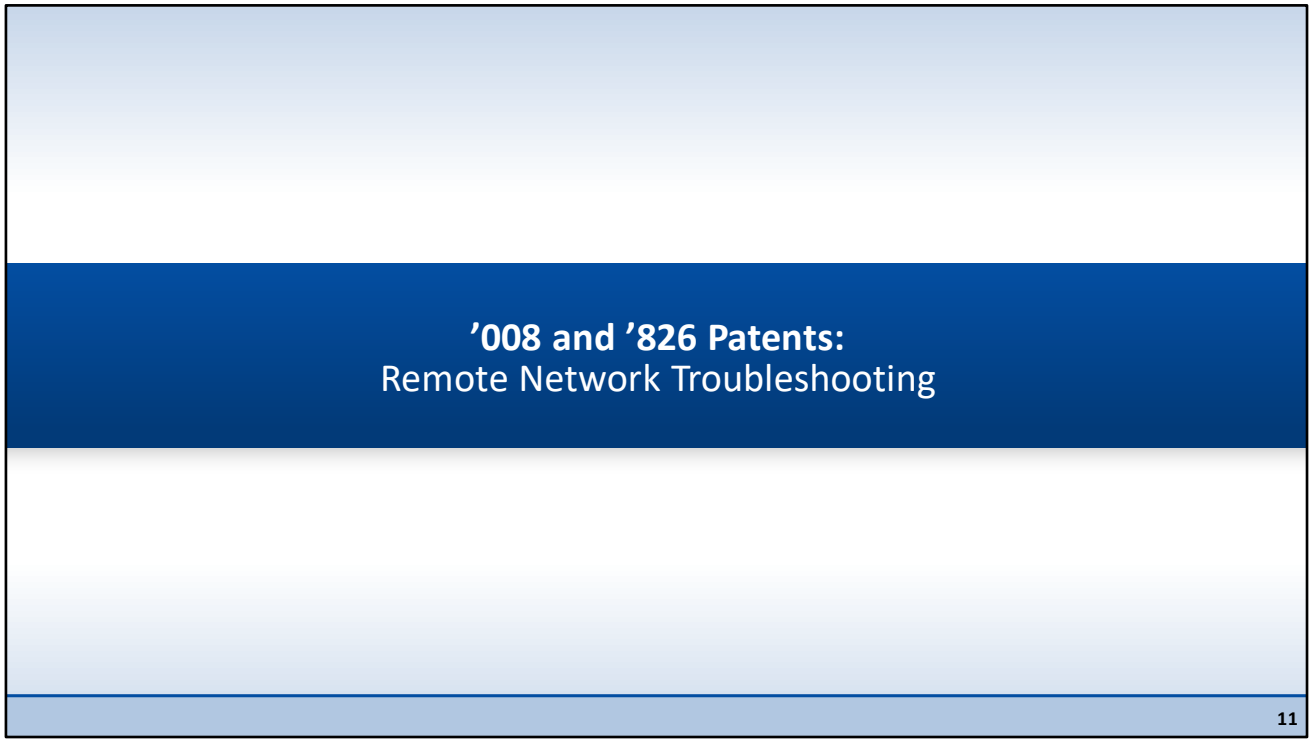


"high-speed (i.e. high sampling rate) converters to maximize the dynamic range" '362 Patent, 5:13-15

'362 Patent at Fig. 4 (excerpt)

10

The last category of technology is called Full Band Capture or Full Spectrum Capture. Full Band Capture enables a customer's gateway or receiver device to capture the entire bandwidth of a received signal. The '362 Patent is directed to the use of wideband analog-to-digital converters (ADCs) to convert the received signal from analog to digital. The digital signal is processed to recover content, such as tuning specific television channels.



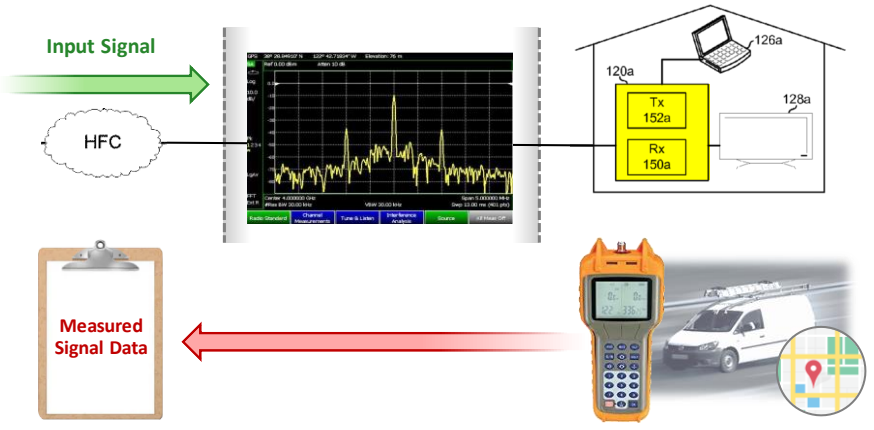
Next, we'll look at the '008 and '826 Patents. As mentioned before, the '826 Patent is a continuation of the '008 Patent. Therefore, we'll discuss these patents together for convenience. These two patents fall within the Remote Network Troubleshooting category of technology. These patents relate to monitoring and reporting signal characteristics of a received signal. But before we discuss the patents themselves, let's talk about the problem they were designed to solve.

Technology Overview – Customer Premises

Remote Network Troubleshooting

'008 PATENT

'826 PATENT



12

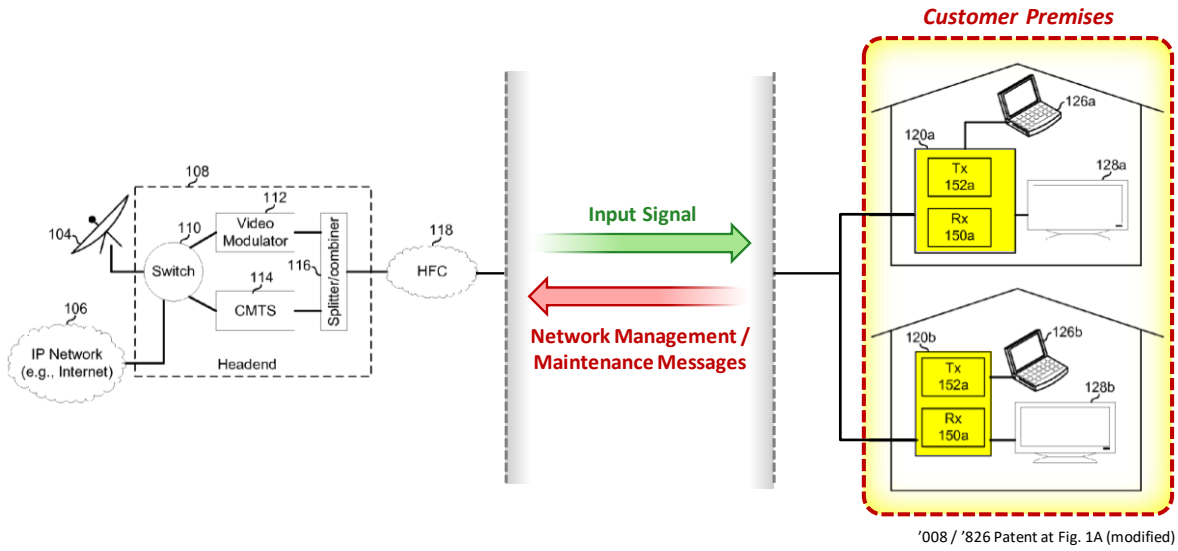
We've all experienced issues with our TV or internet service. At one time, the solution was for your cable operator to send a technician out to your home or business with diagnostic equipment. Signal analyzers are one example of diagnostic equipment that tap into the signal being sent to a customer premises and provides a read out of various signal quality metrics. These signal analyzers can be expensive, on top of the cost of sending a technician out in the field.

The '008 and '826 Patents address this problem by enabling devices located in the customer's premises to remotely monitor the service at the customer premises and report information back to the cable operator. This eliminates the need for an in-person house call.

The ability to remotely monitor signal characteristics and report those characteristics back to a facility operated by a cable service provider drastically reduces costs while also providing invaluable insight for the cable service provider.

Data is money and, using the technology embodied in the '008 and '826 Patents, cable service providers have a remarkable amount of data regarding their products, their network, and their customers at their disposal.

’008 and ’826 Patents – Remote Network Troubleshooting

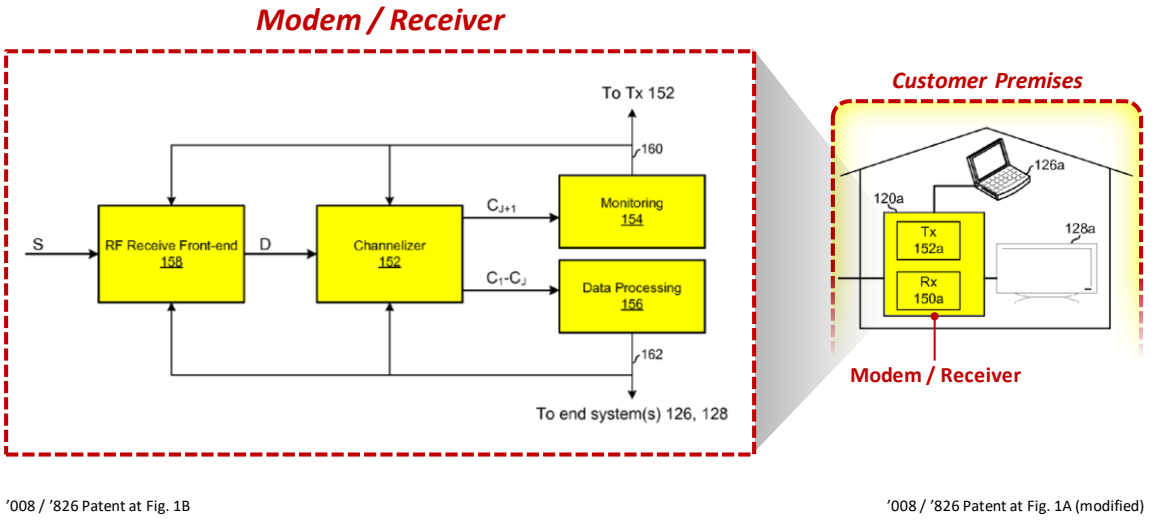


’008 / ’826 Patent at Fig. 1A (modified)

13

The bidirectional nature of communications between customer premises equipment and the equipment operated by the cable service provider is illustrated here. The input signal travels downstream to Customer Premises Equipment devices, such as a cable modem or set top box, located at the customer premises. The Customer Premises Equipment devices monitor the incoming signal and report information back upstream to the cable operator. These reports can be called network management or network maintenance messages.

’008 and ’826 Patents – Remote Network Troubleshooting



’008 / ’826 Patent at Fig. 1B

’008 / ’826 Patent at Fig. 1A (modified)

14

A receiver circuit, located in Customer Premises Equipment, can include several subcomponents or modules, including an RF Front End (158); a Channelizer (152); a Monitoring Module (154); and a Data Processing Module (156).

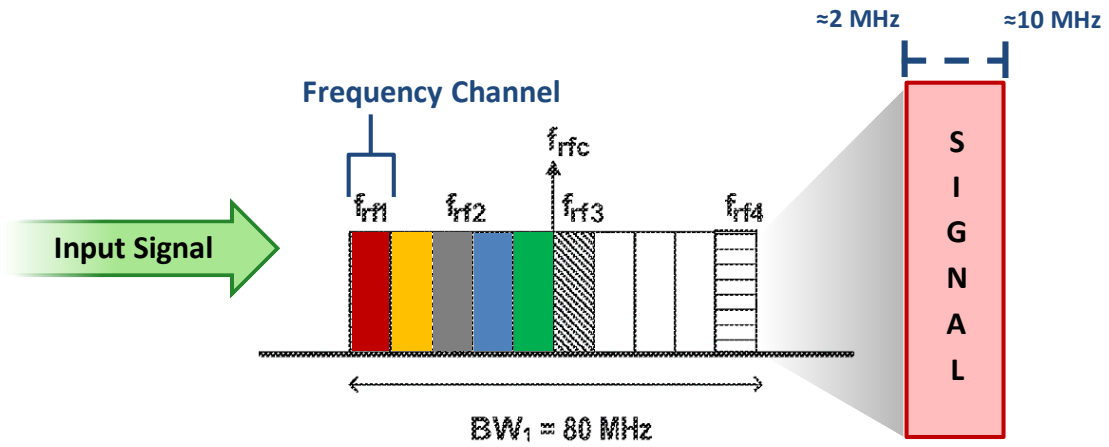
The RF Front End receives an analog input signal (labeled “S”) spanning an entire spectrum. The RF Front end digitizes the input signal and outputs a digitized signal (labeled “D”).

The Channelizer selects a first portion and a second portion of the digitized signal D and concurrently outputs the selected portions to the Monitoring Module and Data Processing Module. The concurrent output means that signal monitoring can occur without interrupting the customer’s television service.

The Monitoring Module analyzes the portion of the signal provided by the Channelizer to determine properties (e.g. characteristics) of the signal. Network management messages describing the measured characteristics can be sent back to the source of the received signal, i.e. the cable operator.

The Data Processing Module processes the signal provided by the Channelizer and recovers content stored on the signal. For example, the content can include television programming and recovering this content allows the customer to watch desired television channels.

'008 and '826 Patents – Communication Channels

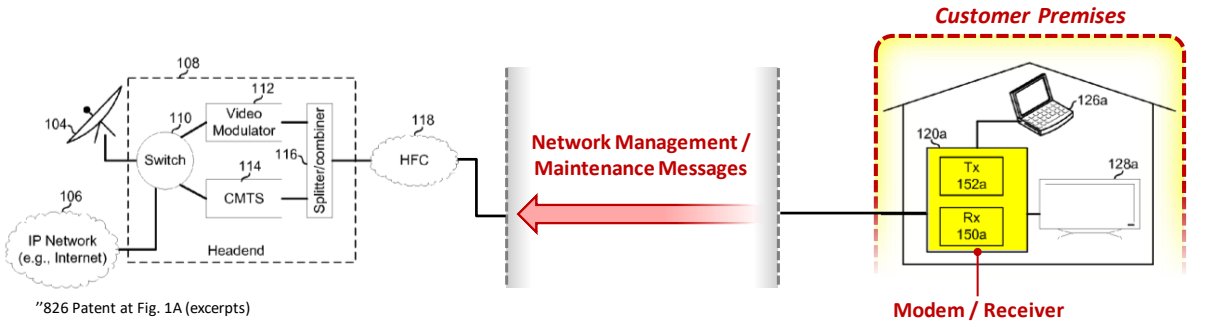


15

A communication channel includes one or more frequencies that carries data. An input RF signal can include one or more channels that are located at portions of a radio frequency spectrum. A communication channel has a bandwidth, which is both a measure of the distance between the highest and lowest frequencies of the communication channel and a measure of how much data can be transferred via the communication channel. The bandwidth of a particular channel can vary, for example, the illustrated channel has a bandwidth of approximately 8 MHz.

While the word "channel" may be used in the TV space to refer to a TV Channel, such as ESPN, HGTV, etc., that is not how channel is used in the asserted patents when referring to communication channels.

'826 Patents – Remote Network Troubleshooting



''826 Patent at Fig. 1A (excerpts)

Measured/Monitored Characteristics:

- Signal power level vs. frequency
- Phase shift vs. frequency
- Type and/or amount of modulation
- Interference levels
- Signal to noise ratio (SNR)

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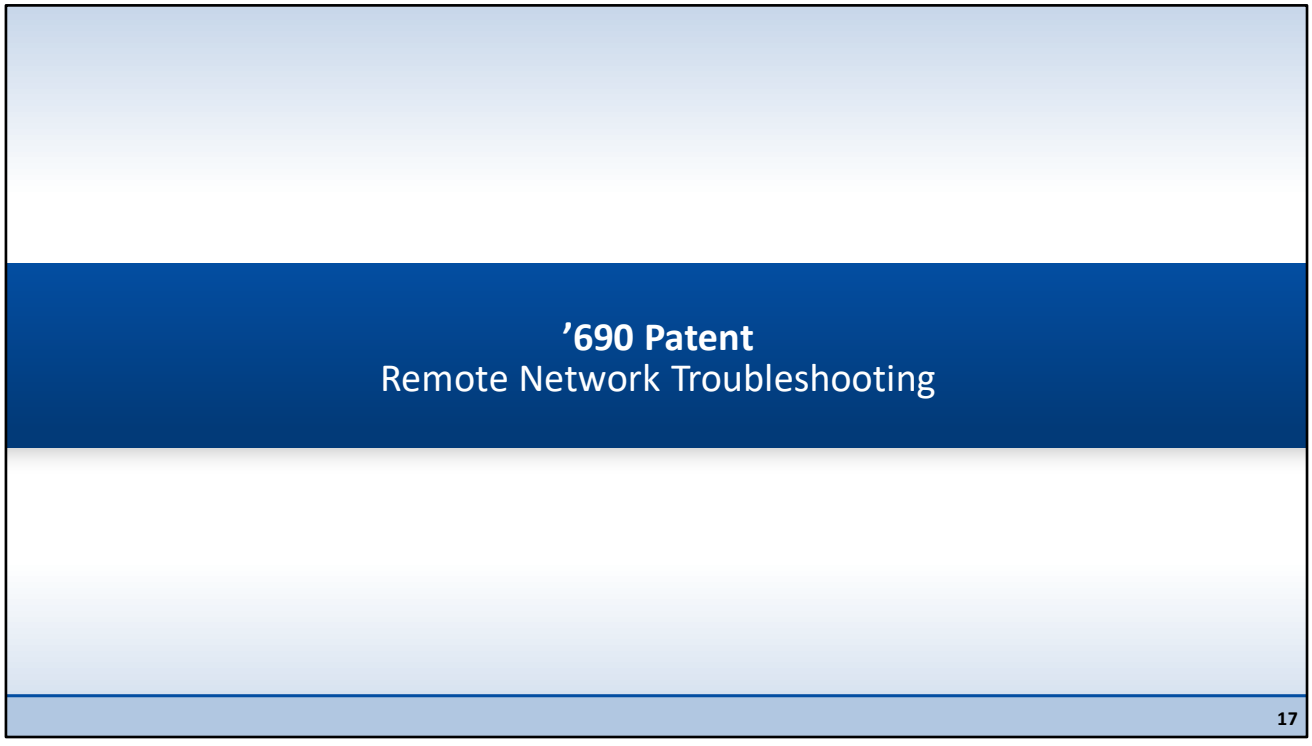
As previously discussed, the Monitoring Module of the receiver generates data describing characteristics of the received signal. Examples of signal characteristics that can be monitored and reported by the gateway include the Signal power level vs. frequency, the Phase shift vs. frequency, the Type and/or amount of modulation, Interference levels, and Signal to noise ratio (known as SNR). However, any of a variety of characteristics can be included.

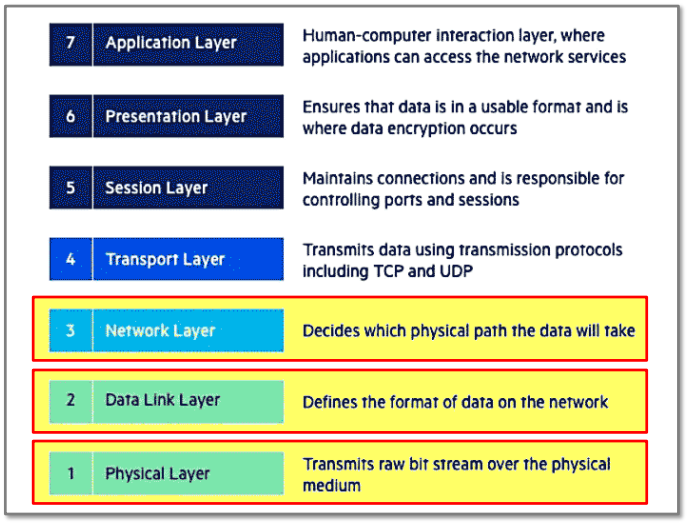


The '690 Patent falls within the Remote Network Troubleshooting category of technology. Specifically, the '690 Patent is directed to diagnosing problems with customer services by using probes within a network. But first, let us explore a conceptual model of a computer network.

’690 Patent – Network Layers: The OSI 7 Layers Explained

Remote Network Troubleshooting

’690 PATENT



https://www.imperva.com/learn/application-security/osi-model/

18

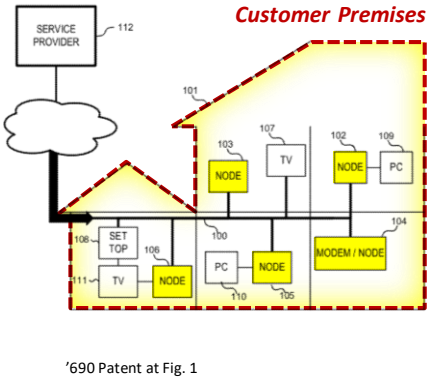
The Open Systems Interconnection (or OSI) Model of network layers utilized in the context of the ’690 Patent, is illustrated on this slide. The OSI Model is commonly used in the industry to understand the various technologies and techniques used to transmit data from one device to another.

In the OSI model, the lowest layer is the Physical Layer ((P-H-Y, also pronounced “fie”), while the next layer up is the Data Link Layer. The Data Link Layer includes a Medium (or Media) Access Controller (which is referred to as MAC), which interfaces with the Physical Layer and the Network Layer to facilitate the conversion of physical communication signals (sent via the physical layer) to digital data that is processed in the Network Layer and above.

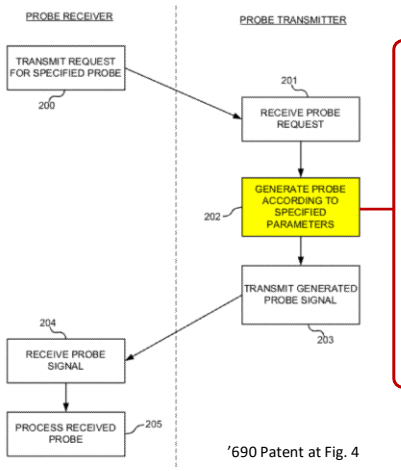
In general, the Data Link Layer provides functionality including addressing management of source and destination addresses and error detection.

A MAC address is a unique identifier assigned to every device that connects to a network. Devices in the network use these addresses for a variety of purposes, including identifying specific devices in the network and managing routing tables and other data structures.

’690 Patent – Remote Network Troubleshooting Using Probes and “a plurality of parameters”



’690 Patent at Fig. 1



’690 Patent at Fig. 4

Example Parameters:

- The modulation profile for the probe
- The payload content of the probe
- The number of times to transmit the probe
- The preamble type for the probe
- The cyclic-prefix length for the payload of the probe
- The transmit power for the probe

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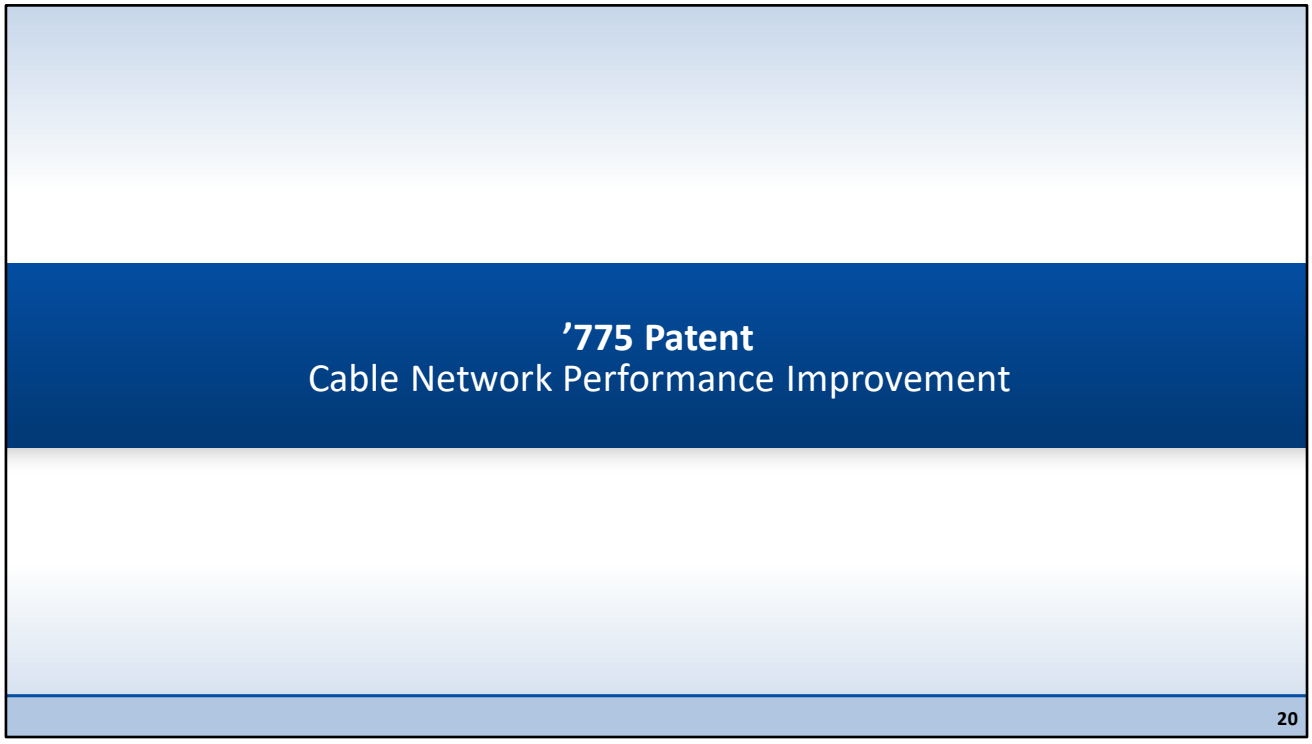
The ’690 Patent describes the use of probes to characterize the communication channel over which data is transmitted within a customer premises network. These probes are generated in response to a request from another node.

The slide illustrates an example embodiment.

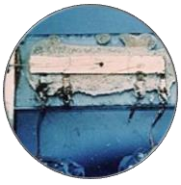
- The left side of the slide shows a customer premises network, which includes numerous network devices, or “nodes.”
- These nodes are programmed to generate a probe in response to a request.
- The request may be created by the device expecting to receive the probe, and the request may specify parameters to be used in creating the probe.
- A list of example parameters is featured on the right side of the slide.



The '775 Patent falls within the Cable Network Performance Improvement category of technology and is directed towards a novel architecture for cable modems.

'775 Patent - Timeline

1958

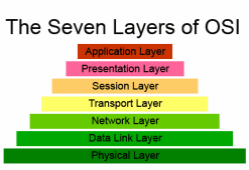


First integrated circuit (IC) invented

1974

Earliest Systems-on-Chips (SoC's) used in LCD watches

1984

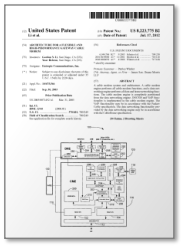


Open Systems Interconnection (OSI) model adopted as an international standard

1985

Acorn Computers develops first Advanced RISC Machine (ARM) processor

2003



'775 Patent is filed

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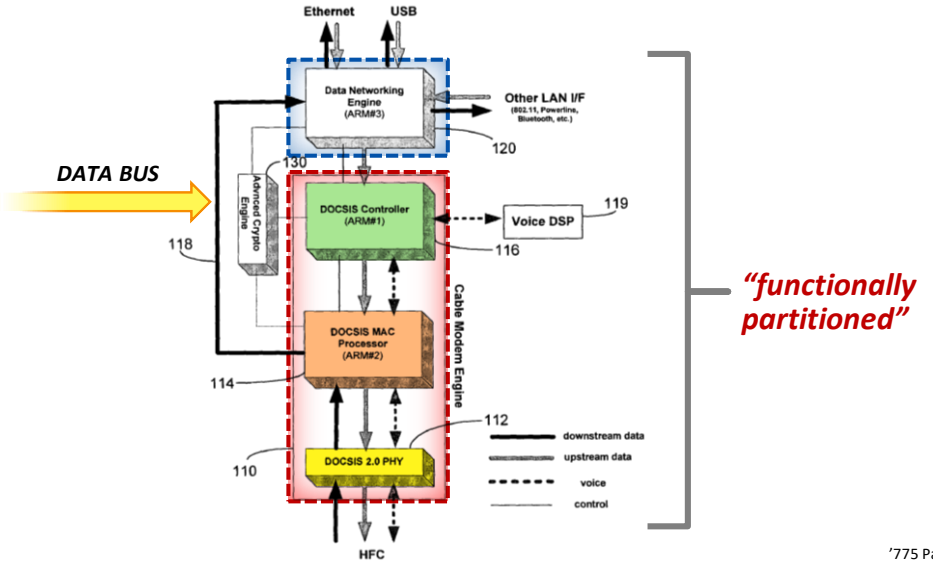
This slide provides background information on the development of computer processor technology. As shown on this timeline, the first integrated circuits were introduced as early as 1958. By the mid-'70s, systems-on-chip, or S-O-C's, were beginning to see use in commercial products.

The mid-'80s saw the introduction of the OSI model. That same decade also saw the introduction of the first ARM processors. ARM is a widely used family of computer architectures based on a reduced instruction set computer (RISC) instruction set.

By the time the '775 Patent was filed in 2003, all of these developments were well known in the art and had been for nearly 20 years.

’775 Patent – Cable Modem Architecture for Cable Network Performance Improvement



’775 Patent at Fig. 1

22

This slide illustrates a block diagram of a cable modem architecture according to the ’775 Patent, which shows the relationship among the functionalities in the disclosed cable modem.

This exemplary cable modem includes three major subsystems:

- a Data networking engine or DNE (illustrated at the top of the slide within the blue dashed box);
- a Cable modem engine or CME (illustrated by the red dashed box in the middle of the slide); and
- an Advanced crypto engine or ACE (illustrated to the left of the cable modem engine, and shown without any color.)

The cable modem engine itself contains multiple components, including:

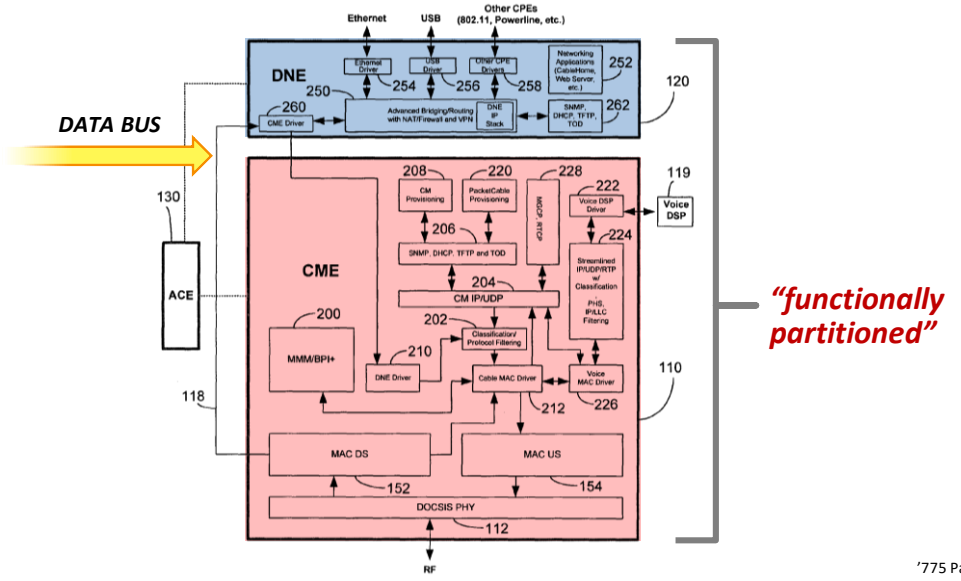
- a DOCSIS Controller (shaded in green),
- a DOCSIS MAC Processor (shaded in orange) and
- a DOCSIS Physical Layer (shaded in yellow).

The cable modem engine and data networking engine, shown in red and blue respectively, are functionally partitioned, meaning each engine is responsible for particular functions. The cable modem engine interfaces with the cable operator’s network to transport data. The networking engine interfaces with an on-premises LAN,

such as WiFi or Ethernet to distribute data received from the cable modem engine.

A communication path or "data bus" allows for information to be passed from the cable modem engine to the data networking engine.

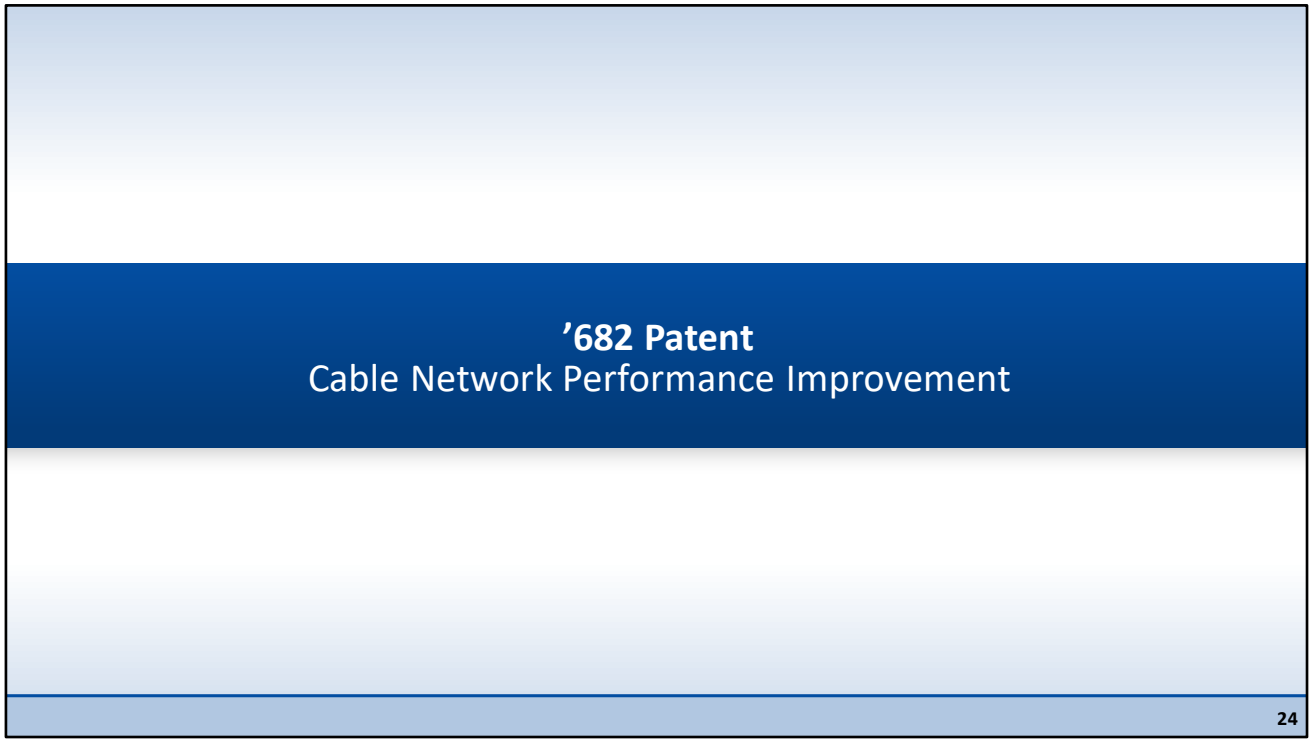
’775 Patent – Cable Network Performance Improvement



’775 Patent at Fig. 2

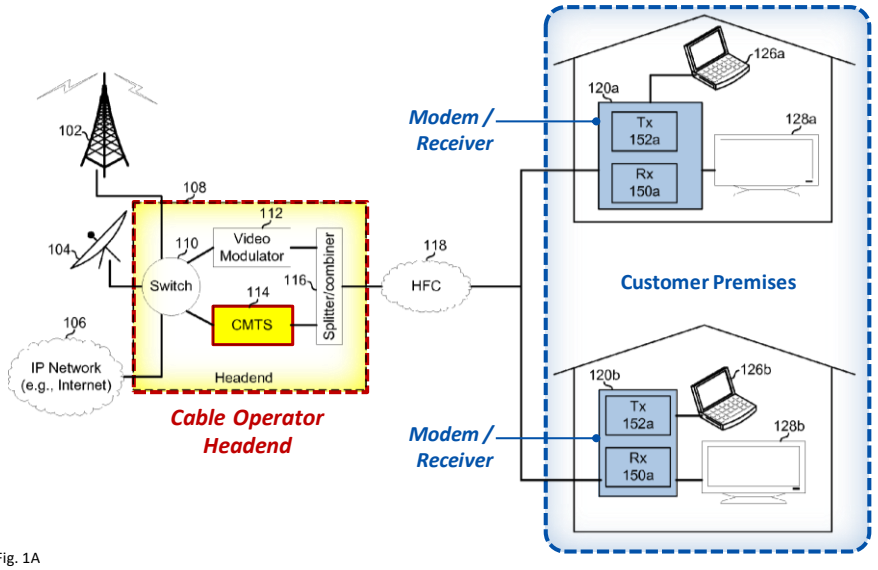
23

This slide provides an additional illustration, using Figure 2 in the ’775 Patent. This image shows the exemplary cable modem architecture which includes a cable modem engine and data networking engine (again, shaded red and blue respectively). The data bus is once again illustrated by communication path 118.



The '682 Patent is also within the Cable Network Performance Improvement category of technology. The '682 Patent relates to how a CMTS manages its communication with the various individual cable modems it serves.

’682 Patent – Cable Network Performance Improvement



’008 / ’826 Patent at Fig. 1A

25

The ’682 Patent relates to specific communications between cable modems (blue) located within a customer premises and CMTS equipment located within the cable operator headend and operated by a cable service provider (highlighted in yellow). A single CMTS generally serves numerous cable modems.

Specifically, the ’682 Patent is directed to methods and systems for a CMTS to determine a plurality of Signal-to-Noise Ratio (SNR) -related metrics for a plurality of cable modems and assign cable modems (also referred to as CMs) into service groups based on the SNR-related metrics.

’682 Patent – Cable Network Performance Improvement

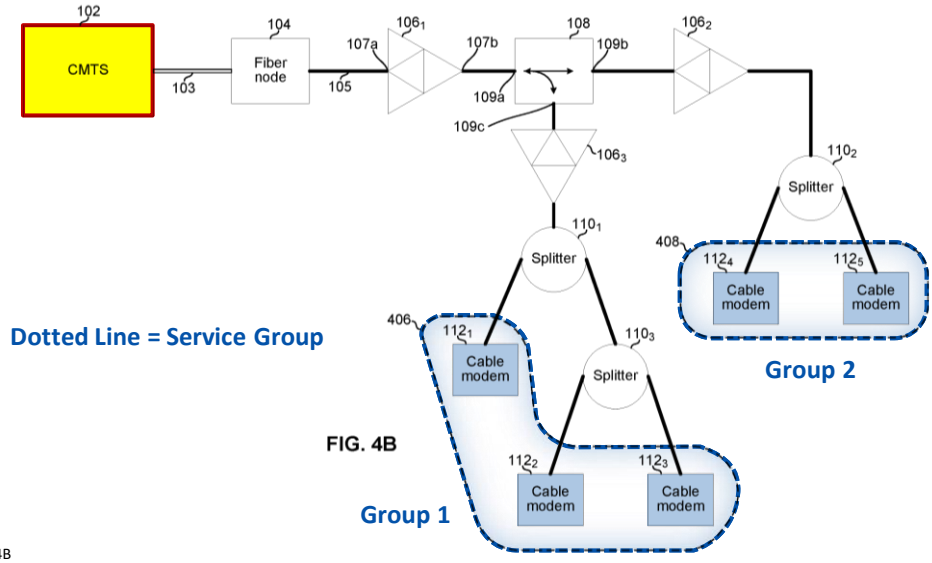


FIG. 4B

’682 Patent at Fig. 4B

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Illustrated here with reference to Fig. 4B of the ’682 Patent is a network with a specific grouping of cable modems.

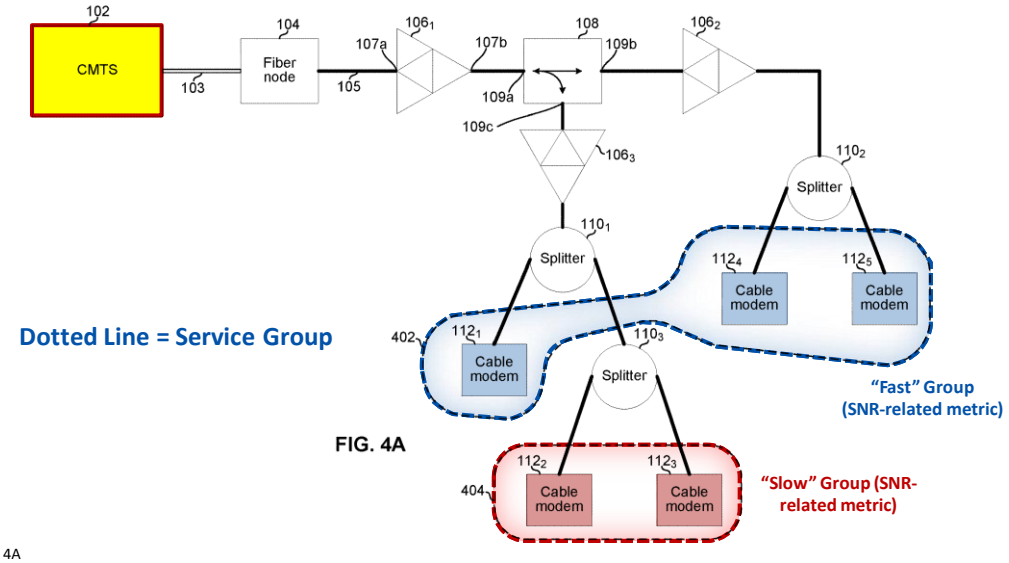
Specifically, various cable modems (highlighted in blue) may be assigned to service groups by the CMTS (highlighted in yellow).

The cable modems in this slide are assigned into service groups based on network topology, or their location in the HFC network.

For example, Service Group 1 (labeled as 406 in the figure) has three cable modems that are all similarly situated in the topology of the HFC network and branch off, directly or indirectly, from Splitter 1101. Similarly, Service Group 2 (labeled as 408 in the figure) has two cable modems that are also all similarly situated in the topology of the HFC network and both branch off of another splitter, splitter 1102, which is located elsewhere in the HFC network. In practice, there may be dozens of service groups and tens or hundreds of cable modems in a service group.

The CMTS can adjust physical layer communication parameters that affect performance and throughput to the cable modems. Rather than the CMTS making adjustments for each individual cable modem, the CMTS can adjust physical layer communication parameters for an entire service group. By controlling groups of cable modems rather than individual modems, the processing demands of the CMTS are greatly reduced. This provides a number of advantages, such as allowing more cable modems to be operated by a single CMTS.

’682 Patent – Cable Network Performance Improvement



’682 Patent at Fig. 4A

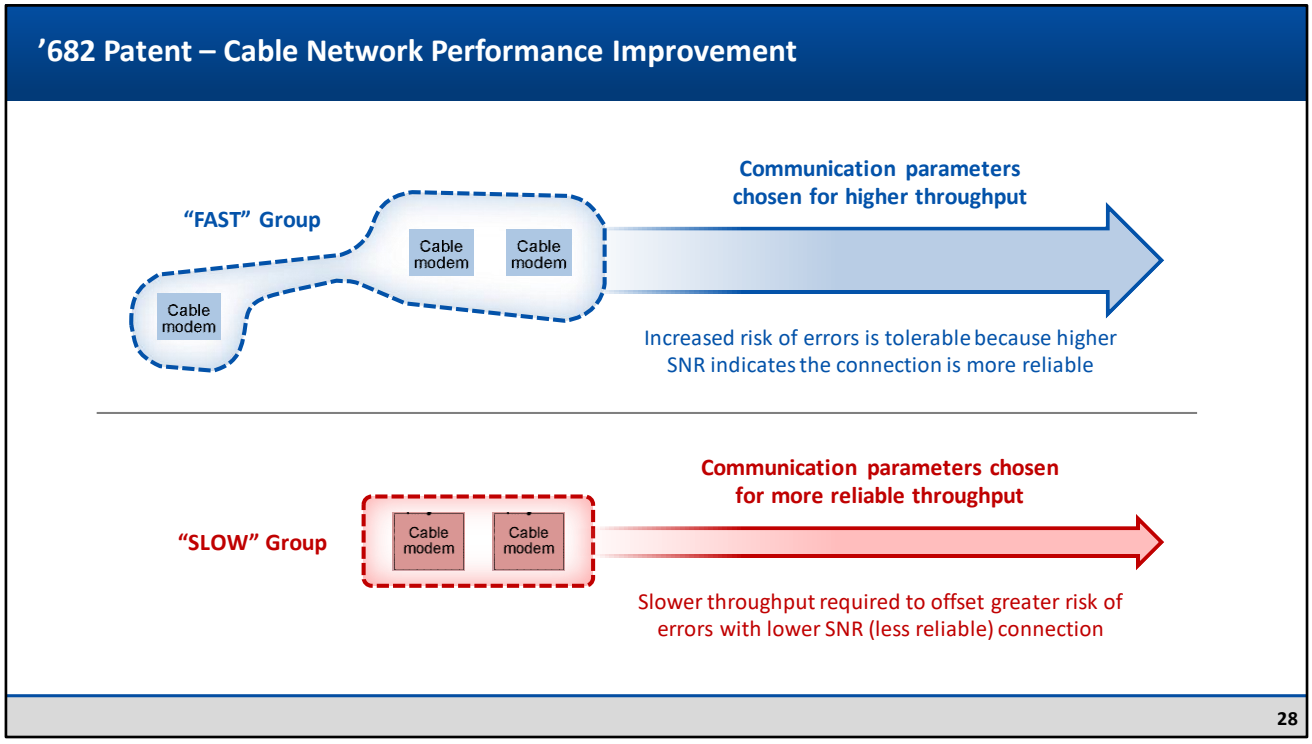
27

Digital communications is a tradeoff between speed and reliability. Faster communications require more reliable communication channels. The speed of communications conducted via a communication channel can be controlled by communication parameters, such as a modulation profile. By varying the communication parameters, a balance between speed and reliability of communications can be achieved. With a higher-speed set of parameters you get better throughput, but you trade off by having a lower tolerance for errors.

For example, cable modems communicating with the CMTS via communication channels having a relatively low SNR (i.e, a noisier communication channel) need to use more robust communication parameters to ensure that their communications are successful. Cable modems that have a relatively high SNR can use communication parameters that allow for higher speeds given the more reliable communication channel.

This slide illustrates the same network as the previous slide with an alternative grouping of cable modems. Specifically, cable modems may be assigned to service groups based on the quality of the cable modem’s connection. This quality can be evaluated by, for example, evaluating a signal-to-noise ratio (SNR)-related metric.

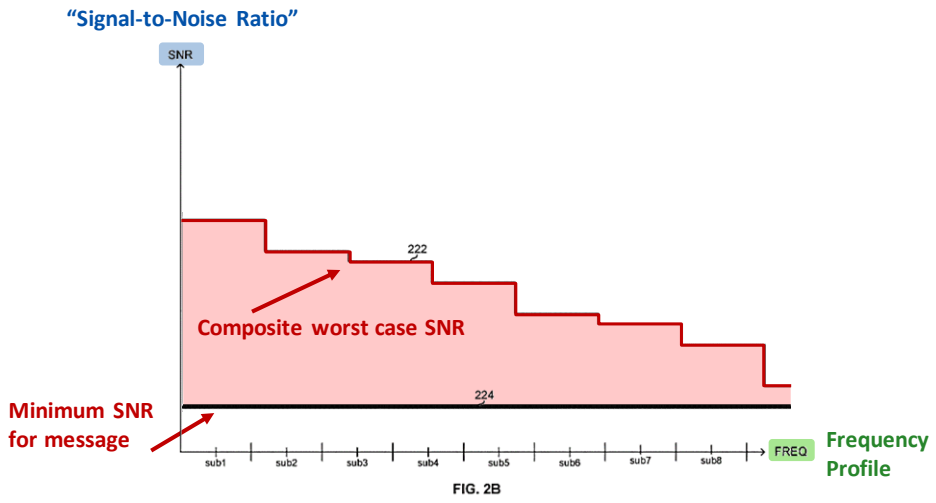
In this way, the CMTS may group cable modems with similar performance together. For example, this slide shows the cable modems grouped into a “slow” group, where the cable modems in the group have relatively low SNRs, and a “fast” group, where the cable modems in the group have relatively high SNRs.



Assigning cable modems using connection quality allows the operator to better match the communication parameters used with the cable modems. Communication with the group of cable modems with high SNR can utilize different parameters than the low SNR group. The "fast group" parameters would allow more throughput and thus higher speeds, but would require a higher SNR for reliable transmission than the low group has available. The slow group parameters would be set differently, to guarantee reliable communication at the cost of throughput.

This allows an operator to avoid the "lowest common denominator" problem. By more precisely organizing cable modems into service groups based on the quality of the communication channel between the cable modems and the CMTS, the CMTS is not forced to use the slower, suboptimal communication parameters with cable modems that can handle higher speeds. By dividing the cable modems into groups based on SNR metrics, and then using communication parameters matched to the SNR, overall throughput is boosted and cable operators can make more efficient usage of their network resources.

’682 Patent – “a composite SNR-related metric … a worst-case SNR profile”



’682 Patent at Fig. 2B (annotated)

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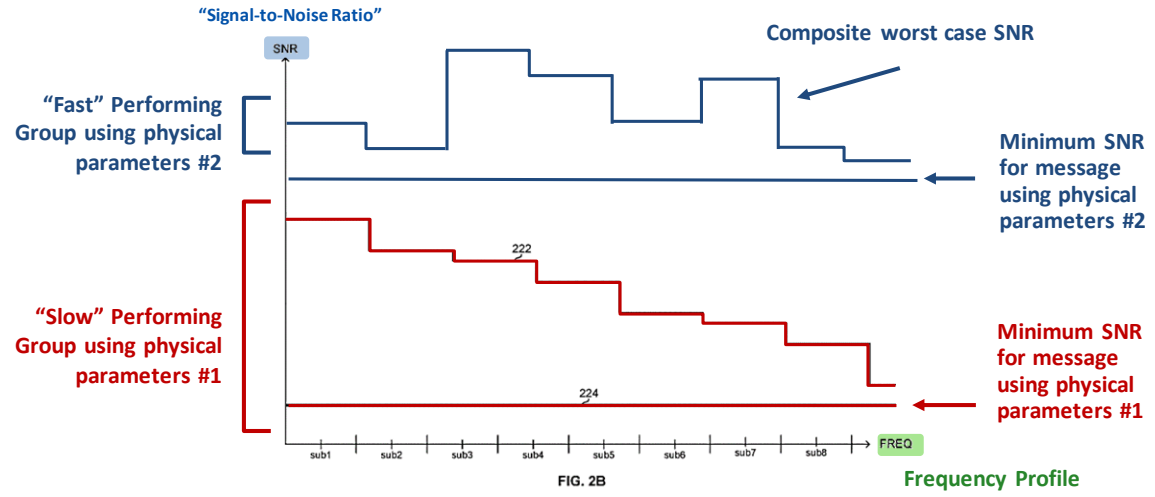
This slide illustrates an example of the composite worst-case signal-to-noise ratio, or “SNR,” profiles relevant to the ’682 Patent. The CMTS determines a worst-case SNR profile across the various frequencies. When the CMTS does this for all cable modems of a particular service group, this is called a “composite” worst case SNR profile.

In this slide, the horizontal axis represents frequency with marks for 8 different subcarriers along the spectrum of frequencies that service groups, and by extension cable modems, may transmit. The vertical axis represents SNR.

The composite worst-case SNR profile is represented by the stair stepped line 222. The flat line 224 is an example of a minimum SNR at which a particular message can be transmitted between the CMTS and the cable modem with acceptable chances of successful receipt.

As we move right along the horizontal axis (which is frequency) the headroom between the two lines get narrower. Accordingly, there is significantly more available headroom for the service groups of cable modems at subcarrier 1 than subcarrier 8, for example; but by using a composite SNR profile, the message can be received at all subcarriers along the spectrum of frequencies.

’682 Patent – “a composite SNR-related metric … a worst-case SNR profile”



’682 Patent at Fig. 2B (annotated)

30

This slide illustrates an example of a composite worst-case SNR profile disclosed in the ’682 Patent represented as the line 222, which is in the stair-stepped red line. Also shown, in blue, is an example of the composite worst-case SNR profile for a group of CM’s with higher SNR.

Note that because a composite worst case SNR is much higher for the “High” service group, the CMTS may set the communication parameters to provide higher throughput, but with less tolerance for errors. Thus the line representing the minimum SNR needed is much higher, shown as the flat blue line. This, however, is an advantage because although more SNR is needed using such parameters, the “High” service group has plenty to spare.

Meanwhile, the cable modems with comparatively low performance would be in the service group utilizing a different composite worst-case SNR profile, shown as the red line 222, and would use physical layer parameters tailored to their performance.

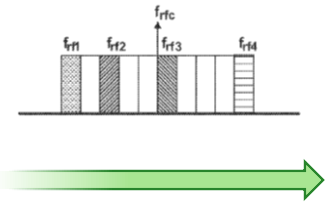
Grouping the cable modems in this way and utilizing different composite worst-case SNR profiles leads to more available throughput for the customers in both the low performing and high performing groups while avoiding the “lowest common denominator” problem previously discussed.

'362 Patent
Full-Band Capture

31

As previously mentioned, the '362 Patent is directed to Full-Band Capture and provides for a wideband gateway or receiver device.

’362 Patent – Full-Band Capture

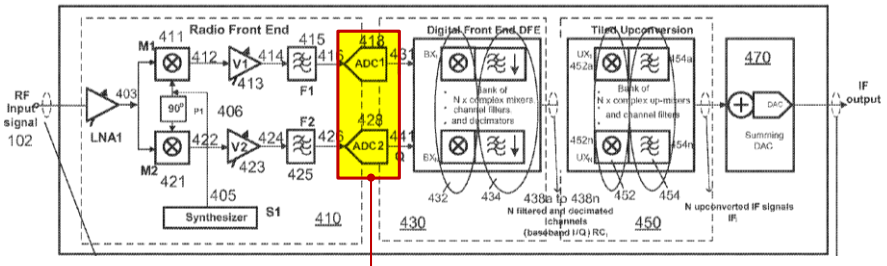


Input Signal
(Analog)

The bandwidth BW1 can be 800 MHz or higher.

Spectrum BW_1 may any other number of desired frequencies.

Wideband Receiver System



“wideband analog-to-digital converters (ADCs)”

’362 Patent at Fig. 4 (excerpt)

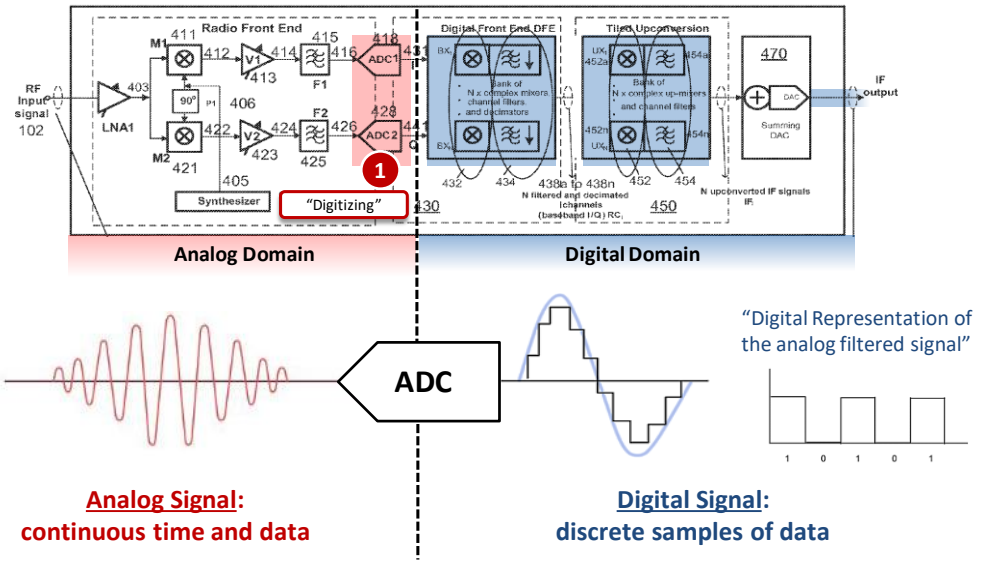
32

The Full-Band Capture process is illustrated here. On the left side of the screen, an analog input signal is received by the wideband receiver system.

The input signal (depicted by the green arrow) can have a bandwidth of 800 megahertz or higher and may contain any number of channels (illustrated by the vertical grey rectangles).

Highlighted in yellow are two wideband analog to digital converters (“ADCs”). In the context of the ‘362 Patent, a wideband ADC is capable of digitizing the entirety of the input signal - that is, capturing the full band of the input signal, hence full band capture.

’362 Patent – Analog Signal v. Digital Signal



Analog Signal: continuous time and data

Digital Signal: discrete samples of data

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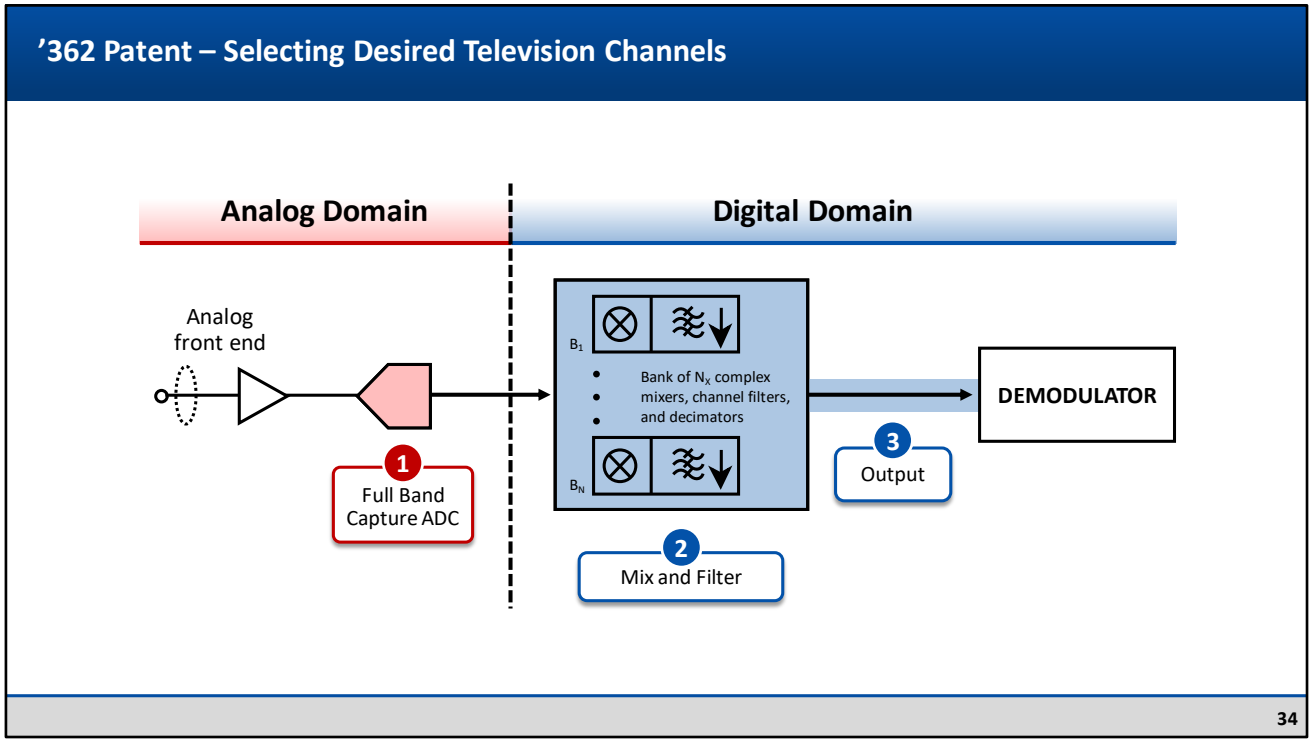
Additional details concerning the difference between analog signals and digital signals are helpful to understand the ADC’s role in the receiver system.

The input signal is an analog signal. An analog signal is a continuous signal that is configured to carry data conveying information. For example, in the context of television, the analog signal carries individual television channels.

As discussed on the previous slide, the ADC or analog-to-digital converter converts the analog signal to a digital signal.

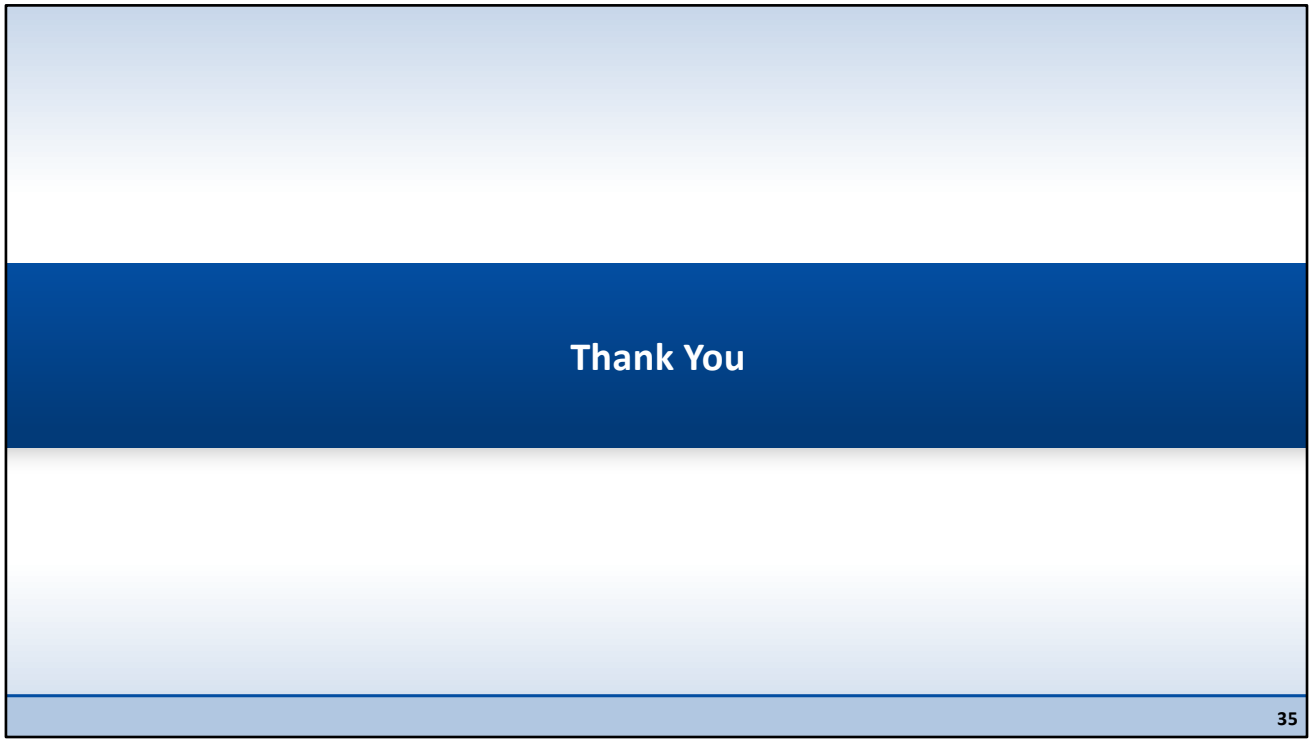
A digital signal represents data as a sequence of discrete values. A digital signal can be produced from an analog signal by an ADC that samples the analog signal at different times and quantizes each sample into a finite set of levels. This converts the continuous analog signal into a set of discrete digital samples, and by sampling the analog signal at a high enough rate, the corresponding digital signal effectively represents the original analog signal. The digital signal can be processed in the digital domain, shown in blue.



Zooming in on the wideband receiver system, this slide provides a more detailed breakdown of the steps involved in Full Band Capture. We've already discussed how the receiver takes an incoming analog signal and digitizes it into a digital signal. It is therefore helpful to think of the receiver as having an analog domain, which operates on analog signals, and a digital domain that operates on digital signals. The ADCs form the dividing line between these domains. The "digitizing" step occurs at the ADC's, which are shown highlighted in red.

Next, we discuss "selecting" a plurality of desired television channels. Digital channel selection is accomplished using digital mixing and filtering techniques. Specifically, the digitized signal is provided to one or more digital mixers, which select the desired channel(s), and the filters remove any unwanted portions of the digital signal.

This results in the selection of desired channels, which can be output for further processing. For example, the selected channels can be output to a demodulator (sometimes called a tuner) which can process the channels to recover content contained in the channels. In the context of television systems, the recovered content can be television channels.



This concludes Entropic Communication's technical tutorial. Entropic again thanks the Court for the opportunity to present this technical tutorial and welcomes any follow up questions.